CONDUIT-SUPPORTING STRUCTURE FOR A SMALL WATERCRAFT

CROSS-REFERENCE TO RELATED APPLICATIONS

[001] The present application claims priority under 35 U.S.C. 119, based on Japanese patent application No. 2002-284216, filed September 27, 2002.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[002] The present invention relates to a conduit-supporting structure for supporting a conduit such as a pipe, wire or cable within a small watercraft. More importantly, the present invention relates to a conduit-supporting structure for a small watercraft that is incorporated into a flotation device, reduces the amount of related support structures and the number of wiring and piping procedures that are necessary during manufacturing of the vessel.

2. Description of the Background Art

[003] A personal watercraft is known as a small vessel that is constructed and arranged to

glide on the surface of a sea or lake. Many jet skis and other different types of personal watercraft are known and are commercially available.

[004] One example of a small watercraft including a vessel body having a hull constituting the lower portion of the vessel body and a deck for covering on top thereof, and defining a floating space between the hull and the deck, is known and described in Japanese Patent Application JP-A-11-157482.

[005] A small watercraft employing a cooling system, in which water outside the watercraft is fed through a jet pump and routed through a heat-generating object to be cooled, such as an engine or the like, and wherein the cooling system effectively cools the same and then heat is discharged outside the watercraft is also known, and is described in Japanese Patent Application JP-A-2001-98942.

[006] Although the known devices have some utility for their intended purposes, a need still exists in the art for an improved conduit-supporting structure for a small watercraft. In particular, there is a need for an improved conduit-supporting structure which simplifies the process of assembling the vessel.

SUMMARY OF THE INVENTION

[007] The present invention provides a conduit-supporting structure for supporting a conduit, such as a pipe, wire or cable inside of a small watercraft. In the small watercraft in

the background art described above, a pipe for its cooling system, or a cable for electrical equipment has been supported on a inner wall of the watercraft, with a specific supporting fixture or the like.

[008] Consequently, the number of components required for the watercraft is increased, and the number of processes in piping or wiring during assembly of the watercraft is also increased or made more complicated.

[009] Accordingly, the present invention provides a conduit-supporting structure for a small watercraft in which the problems described above can be minimized or overcome, and thus the number of required components can be reduced, and the number of processes in piping or wiring during watercraft assembly may be reduced or simplified.

[010] In order to achieve the object described above, a conduit-supporting structure for a small watercraft is integrally formed into a floatation insert block, which fits inside the vessel body. The vessel body includes a hull, which forms the lower portion of the vessel body, and a deck for covering on top of the hull. At least one floatation insert block is disposed between the hull and the deck, and the floatation insert block is made with a supporting groove formed therein for guiding the conduit.

[011] The conduit-supporting structure for a small vessel body according to a first embodiment of the invention fits in the vessel body between the hull and the deck. The

support structure hereof includes at least one floatation insert block disposed between the hull and the deck. The floatation insert block is made with a supporting groove formed therein for guiding a conduit, such as a pipe, wire or cable. Therefore, according to the described conduit-supporting structure for a small watercraft, the conduit may be guided and supported by the supporting groove on the floatation insert block.

[012] Therefore, the specific supporting fixture or the like which has previously been used for supporting the pipe or the cable is not necessary, and thus the number of components may be reduced and the number of processes in piping or wiring may be reduced.

[013] For a more complete understanding of the present invention, the reader is referred to the following detailed description section, which should be read in conjunction with the accompanying drawings. Throughout the following detailed description and in the drawings, like numbers refer to like parts.

BRIEF DESCRIPTION OF THE DRAWINGS

[014] Figure 1 is a side view, partially cut away, of a small watercraft using a selected illustrative embodiment of a conduit-supporting structure for a small watercraft according to the present invention.

[015] Figure 2 is a top plan view of the watercraft of Figure 1.

[016] Figure 3 is a partly enlarged cross-sectional view, taken along the line III-III in Fig.

1.

[017] Figure 4 is a schematic diagram showing a cooling system and route of the coolant for an engine which is a component of the watercraft of Figure 1.

[018] Figure 5 is a top plan view, partially cut away showing a rear portion of the vessel body of the watercraft of Figures 1-2, with a deck 15 removed from the vessel body.

[019] Figure 6(a) is a bottom plan view of a floatation insert block according to an illustrative embodiment of the invention. Figure 6(b) is a front view of the floatation insert block, and Figure 6(c) is a cross-sectional view of the floatation insert block, taken along the line c-c in Figure 6(b).

DETAILED DESCRIPTION OF THE INVENTION

[020] Referring now to the drawings, a selected illustrative embodiment of the present invention will be described. It will be understood that the invention is not limited to the depicted embodiment, but can be made in different shapes and dimensions to fit the shape of any particular watercraft.

[021] As shown in the drawings (mainly in Figure 1), a small watercraft 10 is a saddle riding type small watercraft, in which an occupant is able to sit on a seat 12 of a vessel body 11 and to operate the watercraft while gripping a steering handle 13 with a throttle lever.

[022] The vessel body 11 is a floating structure, having a vessel body 11 formed by joining

a hull 14 and a deck 15, and defining an interior space 16 inside the vessel body.

[023] As shown in Fig. 3, a plurality of floatation insert bodies **F** (See Fig. 3) are disposed in the interior space 16 between the hull 14 and the deck 15, along substantially the entire periphery of the vessel body 11. The floatation insert bodies **F** are preferred to be formed from a resilient plastic material, such as for example, synthetic plastic or resin foam. The material of the floatation insert bodies **F** should be a buoyant material, which floats in water.

[024] An engine 20 is mounted on the hull 14 in the interior space 16, and a water jet propeller (hereinafter referred to also as jet pump) 30, as propulsion means driven by the engine 20, is disposed at the rear of the hull 14.

[025] The jet pump 30 includes an impeller 32 disposed in a channel 18 extending from a water intake 17 opening toward the bottom through a jet flow port 31 opening toward the rear end of the vessel body to a deflector 38, and a shaft (drive shaft) 22 for driving the impeller 32 is connected to an output shaft 21 of the engine 20 via a coupler 23. Therefore, when the impeller 32 is rotated by the engine 20 via the coupler 23 and the shaft 22, water taken from the water intake 17 is injected from the jet flow port 31 through the deflector 38, whereby the vessel body 11 is propelled. The number of rotations of the engine 20, that is, a propelling power generated by the jet pump 30, is controlled by rotating a throttle lever 13a (See Fig. 2) of the operating handle 13. The deflector 38 is linked to the operating handle 13 via an

operating wire, not shown, and rotated by operating the handle 13, whereby the direction of travel of the vessel body 11 can be changed.

[026] Figure 4 is a drawing showing the cooling system for a small watercraft as described above, and is a drawing showing the route of the coolant in this system.

[027] As shown in the same figure, a coolant intake port 36 is provided on the jet pump 30 downstream from the impeller 32, so that part W1 of jet water flow W generated by the impeller 32 is siphoned off by intake port 36 and used as coolant W1. The coolant W1 is supplied to a water jacket of the cooing object (engine 20, intercooler 22, and so on) through a coolant pipe P1- connected to the intake port 36.

[028] The coolant W1 from the coolant pipe P1 connected to the intake port 36 is branched into pipes P2 and P3.

[029] The coolant W2 in a first branch pipe P2 is fed to, and cools the oil cooler OC in the oil tank OT (See Fig. 1, Fig. 2) provided on the front portion of the engine 20. After leaving the oil cooler OC, the coolant water is fed through pipe P4 to cool the cylinder block and a cylinder head of the engine 20, and then is drained to a water flow (outside the watercraft) generated by the jet pump 30 via a pipe P5.

[030] The coolant W3 in the other branch pipe P3 is fed to and cools the intercooler 22 (See Fig. 2, Fig. 3), and then fed through a pipe P6 to cool the exhaust manifold 23 (See Fig 2,

Fig. 3).

[031] After it has cooled the exhaust manifold 23, the coolant W3 is then further branched into pipes P7 and P8 above the exhaust manifold 23.

[032] One sub-branch pipe P7 is connected to a pilot water nozzle (not shown) at the extremity thereof, and a coolant W4 flown to the pipe P7 is drained from the pilot water nozzle to the outside the watercraft.

[033] The coolant W5 in the other sub-branch pipe P8 is fed to and cools a turbocharger 24 (See Fig. 2, Fig. 3), and is then fed through a pipe P9 to cool a first exhaust pipe 51, a back-flow preventing chamber 52, and a second exhaust pipe 53. After it has cooled the second exhaust pipe 53, the coolant water W5 is then injected from the lower end of the second exhaust pipe 53 into the water muffler 60. In the water muffler 60, the coolant water W5 is joined with exhaust gas in the water muffler 60, and is then discharged through an exhaust/drain pipe 54 (See Fig. 1, Fig. 2) and thence into a water flow (outside the watercraft) generated by the jet pump 30.

[034] Part W5' of the coolant W5 which has cooled the first exhaust pipe 51 is flown through a pipe P10 and joined into the aforementioned pipe P7, and then drained from the watercraft through the pilot water nozzle with the coolant W4.

[035] Figure 5 is a general plan view showing a rear portion of the vessel body with the

deck 15 removed.

[036] In Figure 5, F1 designates an illustrative floatation insert block F, which is disposed at a rear corner of the vessel body 11.

[037] As described above, P5 represents a pipe for routing coolant water, which has cooled the engine 20, into a water flow generated by the jet pump 30. In this embodiment, and as will be further described herein, the coolant pipe P5 fits into a groove in, and is supported by the aforementioned floatation insert block F1.

[038] Referring now to Figures 6(a) through 6(c), the floatation insert block F1 includes a main block body 70 which is constructed and arranged to fit nestingly in a selected portion of the interior space inside the vessel body. The main block body 70 is made with a supporting groove F1a formed therein, for supportively receiving and guiding the aforementioned pipe P5.

[039] Further in this embodiment, the floatation insert block F may be made with one or more additional grooves formed therein, for guiding other conduits, which may include pipes, wires and/or cables.

[040] In this manner, provision of the supporting groove(s) for guiding conduits such as the pipe and/or the cable through the floatation insert block F enables the conduit to be guided along the supporting groove. The conduit may also be held by the insert block F at the

supporting groove by being pushed therein, taking advantage of the resiliency of the floatation insert block F.

[041] In the conduit-supporting structure for a small watercraft as described above, the vessel body 11 is constructed by the hull 14, constituting the lower portion thereof, and the deck 15 for covering on top of the hull. The floatation insert block F is disposed between the hull 14 and the deck 15, and the floatation insert block F is made with the supporting groove formed therein, for guiding the pipe and/or the cable. Therefore, according to the conduit-supporting structure for a small watercraft, the pipe and/or the cable can be guided and supported by the supporting groove on the floatation insert block.

[042] Therefore, the specific supporting fixture or the like, which has previously been needed for supporting the pipe or the cable is not necessary, which reduces the number of components required, and simplifies the processes of piping and wiring during assembly of the vessel.

[043] Although the present invention has been described herein with respect to a selected embodiment, the foregoing description is intended to be illustrative, and not restrictive. Those skilled in the art will realize that many modifications of the preferred embodiment could be made which would be operable. All such modifications, which are within the scope of the appended claims, are intended to be within the scope and spirit of the present invention.